



2005 Minerals Yearbook

NORWAY

THE MINERAL INDUSTRY OF NORWAY

By Chin S. Kuo

Norway's gross domestic product (GDP) growth was 2.3% owing to the Government's stimulative fiscal policy and to economic recovery in Europe and the United States. The country was one of the world's richest countries in terms of the per capita GDP based on purchasing power parity, which in 2005, was \$42,364. Inflation remained low at 1.6% (International Monetary Fund, 2006[§]). The most important industries were chemicals, fishing, metals, pulp and paper products, and shipbuilding. The mining and quarrying sector accounted for mine production of feldspar, graphite, ilmenite, iron ore, and limestone. Norway also was a mineral processor of aluminum, cadmium, cobalt, copper, ferroalloys, nickel, and zinc. Platinum-group metals were recovered from imported nickel and copper concentrates. However, the petroleum sector contributed significantly to Norway's economic vitality. The country's oil production capacity was more than 3 million barrels per day.

Norway was the third ranked oil exporter and the seventh ranked gas exporter in the world. It provided much of Western Europe's oil and gas requirements, particularly those of France, Germany, and the United Kingdom. The Government reported that despite a low resource replacement rate and a market perception of Norway's mature oil and gas provinces, the best potential large finds were in the Barents Sea, in deep water zones in the Norwegian Sea, and on acreage around Lofoten Island in northern Norway. The first two would be the focus of the 19th licensing round, which was scheduled for June 2005. Statoil ASA estimated that the Norwegian side of the Barents Sea held about 8 billion barrels of oil equivalent. The Norwegian North Sea also was underexplored. Of two possible discoveries in 2005—the Royal Dutch/Shell Group's gas condensate find at its President license and Norsk Hydro A/S's Obelix oil find in the Barents Sea—the latter oil find proved to be disappointing according to the company's 2005 annual report (Alexander's Gas & Oil Connections, 2005[§]).

Commodity Review

Metals

Norsk Hydro, which was the country's major aluminum producer, planned to close the Soderberg potlines at its Hoyanger plant in Norway by the first quarter of 2006. The closure of the production lines would affect 90 employees. Hoyanger would have a production capacity of 55,000 metric tons per year (t/yr) of primary aluminum after the closure. Norsk Hydro was involved in business development programs at Hoyanger to mitigate the impact of lost jobs. At Sunndal, production of primary aluminum increased in 2005 owing to an expansion project (Norsk Hydro A/S, 2005).

[§]References that include a section mark (§) are found in the Internet References Cited section.

AS Sydvaranger's shuttered Bjernevatn iron ore mine in northern Norway was put up for sale. Varanger Kraft owned a 67% interest in Sydvaranger and Sor Varanger held the remaining 33%. The mine, which was closed in 1997, had been producing 1.5 million metric tons per year (Mt/yr) of pellet up to that time. The company's deepwater icefree port at Kirkenes was capable of taking vessels of up to 125,000 dead weight tons and was connected to the mine via an 8-kilometer (km)-long rail link (Metal Bulletin, 2005).

Crew Minerals AS was granted the exclusive title for two porphyry molybdenum properties at Hurdal and Skrukkelia in the Oslo region. The Hurdal project was the largest molybdenite deposit in Europe. At Hurdal, some 9,000-meter drillings from 24 holes outlined a deposit that has a preliminary resource estimate of 200 million metric tons at an average grade of 0.2% MoS₂. According to the company, the deposit was strikingly similar to the Climax and the Henderson molybdenum deposits in the United States (Crew Gold Corp., 2005).

Blackstone Ventures Inc. of Canada reported that its geophysical survey of the Espedalen property in south-central Norway demonstrated that the Stormyra electromagnetic conductor for nickel exceeded 1 km in length. Followup diamond drillings consisting of 17 holes on the nickel conductor began in March 2005. Blackstone earned a 60% interest in the property from Sulfidmalm A/S, which was a wholly owned subsidiary of Falconbridge Ltd. of Canada. Falconbridge was to spend \$5 million to earn an additional 20% interest in the project following exercise of the backin right (Blackstone Ventures Inc., 2005).

Blackstone and Sulfidmalm entered into a joint-venture agreement to explore five large nickel-copper-cobalt project areas in southern Norway at Bamble, Ertelien, Evje, Hosanger, and Skjaekerdalen; combined, the areas covered approximately 23,400 square kilometers. Nickel sulfide mineralization would be the focus of the exploration program. Blackstone had the right to earn a 50% interest in the five properties by incurring exploration expenditures of at least \$3.5 million by the end of 2006 and at least \$1.2 million in each of the subsequent calendar years (Falconbridge Ltd., 2005[§]).

Industrial Minerals

SMA Magnesium AS was owned by SMA Svenska Mineral AB, which was one of the leading producers in Scandinavia of lime/dolomitic lime for the environmental, paper, steel, and other markets. SMA Magnesium's seawater process at the Porsgrunn plant used marble, limestone, and dolomite or dolomitic limestone to produce magnesia. A dolomite calcination project for dolime manufacture was being constructed and was due for completion by the end of 2005. Production capacity was 15,000 t/yr of magnesia, including magnesium hydroxide (Industrial Minerals, 2005).

Mineral Fuels

Offshore exploration drilling picked up considerably in 2005 and the Barents Sea began to see more drilling activity. Hydro Norsk planned to upgrade the Oseberg East platform and to drill seven new wells. Norsk Hydro also proposed to produce from the 50-billion-barrel Vilje oilfield through Marathon Oil Corp.'s Alvheim floating production, storage, and offloading unit. Statoil planned to raise new reserves from satellites of its Gullfaks Field in the North Sea. Statoil also was to use a jackup to produce its Volve Field in the southern Viking Graben area between Heimdal and Sleipner (Offshore, 2005).

Norske Shell made a significant discovery of gas in Jurassic sandstones in the Onyx South West prospect in the Norwegian Sea. Two zones were tested; each flowed at a maximum rate of 1.4 million cubic meters per day. Shareholders in production license 225 were A/S Norske Shell (30%), Petoro AS (30%), Statoil (20%), and Total E&P Norge AS (20%). Norsk Hydro made an oil discovery north of Fram in May 2005. The well tested 3.2 barrels per day. The company was considering development of the find using Fram and Troll C infrastructure (Petroleum Economist, 2005a).

The Statoil-led group's Statfjord Field was to go ahead with the late-life development. The group would spend \$2.4 billion to recover an additional 25 million barrels of oil and 32 billion cubic meters of gas. An additional \$248 million would be spent on constructing a new pipeline to allow gas from the Norwegian part of the Anglo-Norwegian Field to flow into the United Kingdom's Far North Liquids and Gas System (Flags) Pipeline. Gas exports from the Norwegian part would start in October 2007. Owners' interests were Statoil (44.34%), ExxonMobil Corp. (21.37%), ConocoPhillips (10.33%), Shell (9.44%), ConocoPhillips (United Kingdom) (4.84%), BP (United Kingdom) (4.84%), and Centrica (United Kingdom) (4.84%) (Petroleum Economist, 2005b).

Statoil expected a network of gas pipelines to be built that would connect the Russian and Norwegian Barents Sea to continental Europe. One or two pipelines would first be built to connect the western Barents Sea gas finds to Europe through the Ormen Lange/Langed system or the Aasgard network. The Barents Sea was estimated to hold about 40 billion barrels of oil equivalent. Gazprom's 3.2 trillion-cubic-meter Shtokman natural gas field in the Russian Barents Sea would be developed and piped in the later phases. Pipelines to connect Shtokman gas to the Norwegian Barents Sea pipe network were foreseen. European natural gas demand was projected to rise to about 750 billion cubic meters per year by 2020 from 500 billion cubic meters per year in 2005 (Rigzone.com, 2005§).

A liquefied natural gas (LNG) project was under construction at Snohvit (Melkoya Island) by Statoil and was expected to start up in 2006. The plant with one train would have a capacity of 4.2 Mt/yr of LNG, which was to be exported to Spain and the United States (Petroleum Economist, 2004).

Infrastructure

Hydropower provided nearly all Norway's electricity; Naturkraft AS, however, planned to build a \$333 million 420-megawatt onshore gas-fired powerplant at Karsto in Rogaland, western Norway. The plant would have a filtering system for nitrogen oxides emissions and possibly a gas scrubbing facility for carbon dioxide emissions. It would deliver up to 3.5 terawatt hours per year to the Norwegian power grid. The plant was expected to start electricity production in the fall of 2007. Naturkraft was owned by Norsk Hydro and Statkraft AS (50% each) (Naturkraft AS, 2005).

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- Rigzone.com, 2005, Statoil sees Barents gas pipe network into Europe by 2020, accessed April 22, 2005, at URL http://www.rigzone.com/news/article.asp?a_id=21989.

Major Sources of Information

Ministry of Petroleum and Energy
P.O. Box 8148 Dep
0033 Oslo, Norway
Norwegian Geological Survey
P.O. Box 3006 Lade
7002 Trondheim, Norway

TABLE 1
NORWAY: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004	2005	
METALS						
Aluminum:						
Primary	metric tons	1,067,600	1,095,500	1,192,400	1,321,700	1,376,500
Secondary	do.	223,900	271,000	256,800	348,700	362,400
Cadmium, smelter	do.	372	209	331	260	260
Cobalt:						
Mine output, Co content ^c	do.	100	100	--	--	--
Metal, refined	do.	3,314	3,994	4,556	4,670	5,021
Copper, metal, refined, primary and secondary	do.	26,700	30,500	35,900	35,600	38,500
Iron and steel:						
Iron ore and concentrate, Fe content		340 ^e	350 ^e	340	408	420 ^e
Metal:						
Pig iron ^e		60	80	90	90	90
Ferroalloys:^e						
Ferrochromium		83 ²	61 ²	-- ²	-- ²	-- ²
Ferromanganese		240	240	245	245	250
Ferrosilicomanganese		230	230	230	230	230
Ferrosilicon, 75% basis		450	390	350	300	270
Silicon metal		100	105	100	105	105
Other		15	15	15	15	15
Total		1,120	1,040	940	900	870
Steel, crude		635	694	698	695	690 ^e
Semimanufactures, rolled ^c		623 ²	630	635	640	650
Magnesium, primary	metric tons	36,000 ^e	10,000 ^e	--	--	--
Nickel:						
Mine output:						
Concentrate ^e	do.	18,000	12,000	--	--	--
Ni content	do.	2,529	2,052 ^r	169 ^r	181 ^r	150
Metal, primary	do.	68,220	68,500	77,200	71,400	84,900
Platinum-group metals ³	kilograms	15,600 ^r	15,600 ^r	-- ^r	-- ^r	--
Titanium:^e						
Ilmenite concentrate		750	750	840 ²	860	860
TiO ₂ content		340	340	378 ²	387	388
Zinc, metal, primary	metric tons	129,300	137,300	143,500 ^r	140,900 ^r	133,300
INDUSTRIAL MINERALS						
Cement, hydraulic ^e		1,870	1,850	1,860	1,870	1,900
Feldspar ^e	metric tons	73,000	75,000	74,000	75,000	88,690 ²
Graphite ^e	do.	2,500	2,400	2,400	2,300	8,893 ²
Lime, hydrated, quicklime ^c		100	100	100	100	100
Mica, flake ^e	metric tons	2,500	2,600	2,600	2,600	2,700
Nepheline, syenite ^c		310	310	300	300	300
Nitrogen, N content of ammonia		323	330	354	420	450
Olivine sand ^e		3,300	3,200	3,100	3,100	3,100
Stone, crushed:^e						
Dolomite		900	900	850	850	513 ²
Limestone		7,500	7,400	7,200	7,300	7,200
Quartz and quartzite		1,500	1,400	1,500	1,500	909 ²
Sulfur, byproduct:						
Metallurgical		105	102	100	85 ^r	80
Petroleum ^c		18	19	20	18 ^r	20
Total ^e		123	121	120	103 ^r	100
Talc, soapstone, steatite ^c		27	28	28	28	26 ²

See footnotes at end of table.

TABLE 1--Continued
 NORWAY: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades ^c	320	310	300	300	300
Gas, natural, marketed ⁴	53,895	65,501	73,124	78,465	84,964
million cubic meters					
Peat, for agricultural use ^c	30	30	30	30	30
do.					
Petroleum:					
Crude ⁵	1,138,400	1,092,800	1,041,400	1,024,400	964,290
thousand 42-gallon barrels					
Natural gas liquids ^c	41,000	41,000	42,000	52,695 ^{r,2}	60,879 ²
do.					
Refinery products: ^c					
Naphtha	27,000	27,000	27,000	8,741 ^{r,2}	10,017 ²
do.					
Gasoline	26,000	26,000	27,000	23,913 ^{r,2}	28,078 ²
do.					
Kerosene	9,000	9,000	9,000	4,774 ^{r,2}	5,771 ²
do.					
Distillate fuel oil	46,000	46,000	47,000	45,765 ^{r,2}	50,121 ²
do.					
Residual fuel oil	12,000	12,000	12,000	13,823 ^{r,2}	11,806 ²
do.					
Other products	4,500	5,000	5,000	3,351 ^{r,2}	4,194 ²
do.					
Refinery fuel and losses	4,000	5,000	5,000	2,757 ^{r,2}	2,977 ²
do.					
Total	129,000	130,000	132,000	103,124	112,964
do.					

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through August 31, 2006.

²Reported figure.

³Data represent exports.

⁴Reported as total methane sales.

⁵Excluding natural gas liquids.

TABLE 2
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Hydro Aluminium ANS (Norsk Hydro A/S, 70%)	Smelters at Ardal, Hoyanger, Karmoy, and Sunndal	600
Do.	do.	Plant at Holmestrand	90
Do.	Elkem Aluminium ANS (Elkem A/S, 50%, and Alcoa Inc., 50%)	Smelters at Farsund and Mosjoen	250
Do.	Sor-Norge Aluminium A/S (Alusuisse Group, 50%, and Hydro Aluminium ANS, 49%)	Smelter at Odda	50
Cadmium	Norzink A/S (Outokumpu Oyj, 100%)	Smelter at Eitrheimsneset	0.3
Cement	Norcem A/S	Plants at Brevik and Kjøpsvik	2,150
Coal	Store Norske Spitsbergen Kulkompani A/S	Mines at Longyearbyen and Svea	450
Cobalt	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	5
Copper:			
Ore, Cu content	Nikkel og Olivin A/S (Outokumpu Oyj, 100%)	Mine at Narvik	1
Metal	Nikkelverk A/S (Falconbridge Nickel Ltd., 100%)	Smelter at Kristiansand	40
Dolomite	Franzefoss Bruk A/S	Mine at Ballagen	350
Do.	Norwegian Holding A/S	Mines at Hammerfall, Logavlen, and Kvitblikk	500
Feldspar	Franzefoss Bruk A/S	Mine at Lillesand	100
Ferrous alloys	Elkem Salten (Elkem A/S, 100%)	Ferrosilicon plant at Straumen	90
Do.	Elkem Bjølvfossen (Elkem A/S, 100%)	Ferrosilicon plant at Alvik	60
Do.	Elkem Thamshavn (Elkem A/S, 100%)	Ferrosilicon plant at Orkanger	60
Do.	Finnfjord Smelteverk A/S, Rana Metal (FESIL ASA, 100%)	Ferrosilicon plant at Mo i Rana	110
Do.	A/S Hafslung Metal (FESIL ASA, 100%)	Ferrosilicon plant at Sarpsborg	75
Do.	Ila og Lilleby Smelteverk (FESIL ASA, 100%)	Ferrosilicon plant at Finnsnes	20
Do.	Oye Smelteverk (Tinfos Jernverk A/S, 100%)	Silicomanganese plant at Kvinesdal	235
Iron, metal	Ulstein Jernstoperi A/S	Hordvikneset	10
Iron ore	Rana Gruber A/S (Norsk Jernverk Holding A/S, 100%)	Mine at Mo i Rana	2,000
Do.	Arctic Bulk Minerals A/S	Mine and plant at Kirkenes	1,500
Lime	Hylla Kalkverk (Nikolai Bruch A/S, 100%)	Verdal/Trondheim Mine and plant	80
Do.	A/S Norsk Jernverk	Plant at Mo i Rana	48
Do.	Ardal og Sunndal Verk A/S	More og Romsdal Mine at Surnadal	20
Do.	Brevik Kalkverk A/S	Alesund Mine at Larsnes	20
Do.	Mjoendalen Kalkfabrik	Plant at Asen/Drammen	7
Limestone	Norcem A/S	Dalen, Bjørntvedt, and Kjøpsvik Mines	1,600
Do.	Vardelskalk A/S (Franzefoss Burk A/S, 100%)	Sandvika Mine	800
Do.	Brevik Kalkverk A/S	Visnes and Glaerum Mines	500
Magnesium	Norsk Hydro A/S (Government, 51%)	Plants at Porsgrunn and Sauda	50
Manganese, alloys	Eramet SA	do.	500
Natural gas	million cubic meters Statoil ASA	Gama, Gullfaks, Sleipner Ost, and Statfjord Fields	12,270
Do.	do. Phillips Petroleum Company Norway	Ekofisk Field	9,900
Do.	do. Elf Petroleum Norge A/S	Frigg, Heimdal, and Ost-Frigg Fields	5,750
Do.	do. Norsk Hydro Produksjon A/S	Troll-Oseberg Field	2,600
Do.	do. Statoil ASA	Mikkel Field	2,100
Do.	do. Total, 40%; Petoro, 30%; Marathon Petroleum Norge AS, 20%; Norsk Hydro Produksjon A/S, 10%	Skirne Field	1,550
Do.	do. BP Petroleum Development of Norway	Gyda and Ula Fields	1,040
Do.	do. Esso Norge A/S	Odin Field	1,000
Do.	do. Amoco Norway A/S	Hod and Valhall Fields	910
Nepheline syenite	North Cape Mineral A/S (Unimin Corp., 84%)	Mine at Stjernoy	350
Nickel:			
Ore, Ni content	Nikkel og Olivin A/S (Outokumpu Oyj, 100%)	Mine at Narvik	3
Do.	Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	0.5
Metal	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	85
Olivine	A/S Olivin	Aheim Mine and plant	2,500
Do.	do.	Stranda Mine and plant	300
Do.	Franzefoss Bruk A/S	Lefdal Mine at Bryggja	500

TABLE 2--Continued
 NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	42-gallon barrels per day	Statoil ASA	Gullfaks, Statfjord, Tommeliten, and Veslefrikk Fields	1,069,300
Do.	do.	Norsk Hydro Produksjon A/S	Brage, Mime, and Oseberg Fields	566,200
Do.	do.	Phillips Petroleum Company Norway	Ekofisk Field	237,500
Do.	do.	Saga Petroleum A/S	Snorre Field	170,000
Do.	do.	BP Petroleum Development of Norway	Gyda and Ula Fields	155,000
Do.	do.	A/S Norske Shell	Draugen Field	90,000
Do.	do.	ExxonMobil Refining & Supply Co.	Slagen Refinery	110,000
Do.	do.	Statoil Mongstad	Mongstad Refinery	200,000
Pyrite		Folldal Verk A/S (Norsulfid A/S, 100%)	Mine at Hjerkind	10
Quartzite		Elkem Tana (Elkem A/S, 100%)	Mine at Tana	540
Do.		Elkem Marnes (Elkem A/S, 100%)	Mine at Sandhornoy	200
Do.		Vatnet Kvarts A/S	Mine at Nordland	150
Do.		Snekkevik Kvartsbrudd	Mine at Kragero	110
Silicon metal		Lilleby Metall A/S (FESIL ASA, 100%)	Plant at Trondheim	9
Do.		FESIL ASA	Plant at Holla	50
Steel		Fundia AB (Norsk Jenverk, 50%, and Rautaruukki Group, 50%)	Plants at Christiania, Mandal Stal, Mo i Rana, and Spigerverk	600
Talc		A/S Norwegian Talc (Pluuss-Staufer AG, 51%)	Mine and plant at Altermark/Knarrevik and Framfjord	90
Do.		Kvam Minerals A/S	Mine and plant at Kvam	6
Titanium, concentrate		Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	800
Zinc, metal		Norzik A/S (Outokumpu Oyj, 100%)	Smelter at Odda	150